SFAC
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VEGETABLE INITIATIVE FOR URBAN CLUSTERS

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From the Editor's Desk

It is a known fact that in present times, fragmentation of landholdings, erratic monsoons and climate change, inter alia, have caused a dent in the productivity of staple crops across India. This is a grim situation for an agrarian economy like ours, as the agriculture sector, which as per present statistics, supports 58% of the population and provides employment opportunity to almost 50%.[1] Such a situation is all the more challenging for small and marginal farmers and they will have to deploy up-to-date and innovative cultivation techniques in order to mitigate plausible risks.

Vegetable farming on a commercial scale has emerged as an appropriate option for small and marginal cultivators who have weathered the uncertain returns from staple crops such as paddy. According to the National Horticultural Board, fruits and vegetables now contribute more than 30% to the overall agricultural output in many of the states such as Himachal Pradesh, Odisha, West Bengal, Jammu and Kashmir, Bihar and Uttar Pradesh. There is an accelerated shift towards vegetable cultivation due to the favourable cost-benefit ratio, in addition to ecological and economic considerations that support this transition. On an average, a farmer needs one cubic metre of water to produce 330 grams of grains. The same quantity of water is sufficient to grow 18 kg of vegetables. Besides, paddy takes a minimum of 100 days to mature, while vegetables are ready for harvesting, depending on what one grows, between 45-60 days. Cereal farming like paddy is un-remunerative on small patches of land, but for vegetables any size will do.[2]

The changing food preferences of both urban and rural populations are very supportive to this shift. A significant percentage of the urban population now demand vegetables and fruits, and livestock products rather than cereals, due to rising incomes and changing lifestyles. The shift has contributed to the scaling-up of India's ranking among vegetable-producing countries across the world and India is currently at the second position in terms of volume of vegetables and fruits produced.

On the other side, analysing the multi-dimensional aspects of vegetable cultivation, the second advance estimates of 2013-14 of National Horticulture Board guesstimates an annual production of 170 million tonnes of vegetables. However, productivity is still

1 IBEF update on Agriculture Scenario in India.
2 The Vegetable Revolution, by K P Prabhakaran Nair on 15 May 2013.

pegged at only 18 ton/ha; this is fairly low as compared to the productivity of other leading vegetable-producing countries.

Among various factors that lead to lack of productivity, one of the important factors may be poor adoption of integrated crop management practices at ground level, especially the lack of appropriate pest/ disease management initiatives. As per study estimates, pests cause productivity losses in the range of 10-20% annually, depending upon the severity of infestation in time and geographic area. Besides increasing the total costs of cultivation, non-prudent pesticide application causes pollution, destruction of natural enemies of pests as well as heavy residual pesticide matter on the produce.

Integrated Pest Management (IPM) is the knowledge-intensive process of decision-making that combines various strategies (biological, cultural, physical and chemical) to sustainably manage pests. IPM is largely an ecological approach to managing pests. Low levels of populations of some pests are needed to keep natural enemies in the field and the aim of IPM is to reduce pest populations so as to avoid damage levels that cause yield losses of epidemic levels. The entry point of an IPM programme may often be focused on reduction of pesticide use. However, the basis of good crop management decisions is a better understanding of the crop eco-system and the farmers understanding what it takes to grow a healthy crop. Therefore, IPM can never be delivered in a "package"; it needs to be developed, adapted and tailor-made to fit local requirements. The designing and practising of effective IPM systems is all about learning and continuously finding solutions to changing ground-level situations and challenges.

In the current issue, our feature article discusses the various aspects of effective pest management techniques.

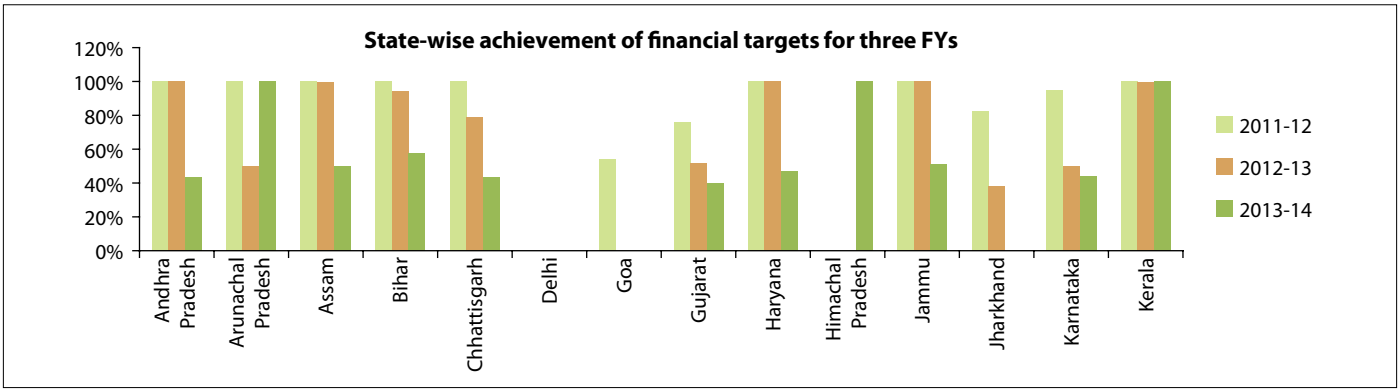
Financial Summary

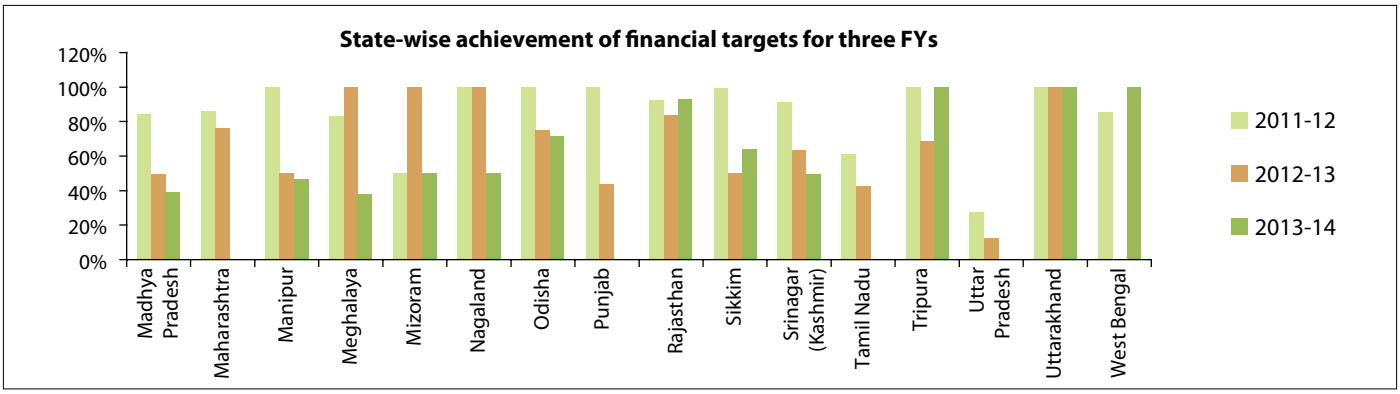
Activities under the fourth financial year for the Vegetable Initiative for Urban Clusters Scheme has commenced in some states like Andhra Pradesh, Jammu, Rajasthan, Sikkim and Telangana. Fund release to other states are in process as per their approved Action Plans, though the activities under the Action Plans 2011-12, 2012-13, and 2013-14 are still in process in several states. Till the month of September 2014, approximately 87%, 72%, and 52% of the financial target has been achieved under Action Plans 2011-12, 2012-13 and 2013-14, respectively.

Under Action Plan 2011-12, the states of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Haryana, Jammu, Kerala, Manipur, Nagaland, Odisha, Punjab, Tripura, and Uttarakhand have achieved 100% of the financial targets while the states of Sikkim and Rajasthan achieved 99% and 92% of the financial target, respectively. The states of Goa, Karnataka, Maharashtra, Meghalaya and Tamil Nadu are still carrying out the activities under the Plan.

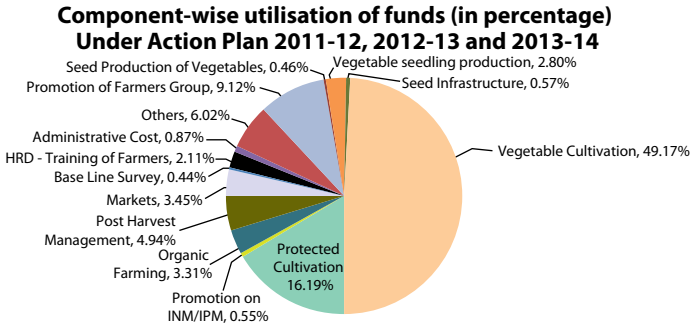
Under Action Plan 2012-13, the states of Andhra Pradesh, Assam, Haryana, Jammu, Meghalaya, Mizoram, Nagaland, and Uttarakhand lead in terms of utilisation, having utilised over 100% of the total approved funds followed by Kerala with 99% achievement of the financial target. The states of Tamil Nadu, Karnataka, and Uttar Pradesh are still carrying out the activities under Action Plan 2012-13 while Goa has not started the activity till date.

Under Action Plan 2013-14, the states of Arunachal Pradesh, Himachal Pradesh, Kerala, Tripura, and West Bengal led in term of utilisation, having utilised over 100% of the allocated funds. West Bengal has shown 100% utilisation of the released funds but their achievement is not 100% due to unavailability of further funds. The states which have utilised 100% of the available funds are Assam, Haryana, Jammu, Mizoram, Sikkim, Srinagar, Uttarakhand, and West Bengal.





Of the total funds utilised till date from year 2011-12 to 2013-14, approximately 50% of the funds have been used for the component of vegetable cultivation followed by vegetable cultivation under protected conditions (16% approx.) and promotion of farmer groups (9%). The utilisation under the post-harvest management and marketing component is merely 3 to 5%.



Northern Region Update

The Northern Region comprises the states of Delhi, Haryana, Jammu & Kashmir, Punjab, Uttar Pradesh, and Uttarakhand. Updates from these states are as stated below:

DELHI

FPOs in Delhi have witnessed a noteworthy event of getting the permission to sell fertilisers and plant protection chemicals. It is a remarkable achievement for FPOs because previously, Delhi state did not have the necessary permission for selling these inputs. Farmers are very pleased after getting the licence for the sale of inputs, as now they will be able to avail of quality inputs at prices cheaper than the retail price. The sale will start from the month of November 2014. FPOs have also planned to start mushroom cultivation in association with the Horticulture Department as additional business enterprise.

HARYANA

The FPO, Rao Mahla Farmer Producer Company Limited is highly enthusiastic with the formation of a Producer Company in their cluster and they are actively carrying out the agri-business activities. The FPO has opened its own office for efficient administration and management. They are carrying out the joint cultivation of various crops like carrot, brinjal, gourd, bitter gourd, tomato, chilli, okra, and zucchini in 5000 ha of area. In addition to this, they are also involved in organic farming in around 10 ha of area. In the coming month, the FPO has planned to open its own retail outlet. Recently they have established a cold storage unit which is under construction. Members are purchasing agri-inputs in groups and are saving around 5-10% of the total cost as profit. The FPO is making around 15 to 20% profit by selling in a group.

FPO Office and discussion with Board Members


Joint production


Cold storage unit (under construction)

The FPO Karnal Vegetable Producer Company Limited is operating actively. Members are carrying out joint transportation of tomato, potato, onion, coriander, cucumber; capsicum etc., using a common vehicle. They are also using a collection centre, and construction of a retail outlet is in progress. The FPO is making efforts for establishing linkages with various retail outlets in Noida and other adjacent states.


FPO Office and collection centre (right)

Under Action Plans 2011-12, 2012-13 and 2013-14, approximately 100%, 100% and 47% of the financial target has been achieved.

JAMMU

A technical training programme was organised in Reasi district on FPO administration and management. FIG members have been provided with seed germination trays. The financing proposal is under progress awith NABARD. The FPO Kashmir Kissan Producer Company Limited has applied to NABARD to link the farmers under the Farmer Club Scheme.

Group members with seedling germination trays (Photographs provided by Actech Jammu)

Model Poly-house constructed with support of NABARD (Photograph provided by Actech Agro)

Gaurikund village, located in the remote hills of Udhampur district, is an integral part of Jammu & Kashmir and is the dwelling for several vegetable-producing farmers. The VIUC scheme has also been implemented in this cluster of Jammu. With the support of the Department of Agriculture, the RI Actech Agro has formed Farmer Interest Groups (FIGs) in this village. These FIGs have also been linked with the Farmers Club Scheme of NABARD. All the FIGs have opened their bank accounts and received several trainings on leadership and management. These farmers are not only aware about modern production and plant protection techniques, but they have also been provided with appropriate training on post-harvest management of vegetables. One of the progressive farmers of this group, Mr. Ashok Kumar, has received training on modern package of practices for vegetables cultivation from Indian Agriculture Research Institute (IARI), New Delhi. He has familiarised the other farmers of this group with the techniques he learnt at IARI. With the support of NABARD, a model poly-house has been recently constructed in the cluster.

The inauguration of this poly-house was done by the Chief General Manager of NABARD. The District Agriculture Officer, Horticulture Officer and other district-level officials, Bank officials also participated in this programme and appreciated the efforts of constructing a model poly-house for learning about protected cultivation methods.

The group has also planned to construct a collection centre which is under construction in the cluster in an area of 500 sq m, for aggregation of produce and direct marketing These farmers are also involved in organic production methods and promoting the use of organic products. Observing the progress of the group, other neighbour farmers have also been encouraged and are approaching the group to learn modern production techniques. FIGs have collectively purchased pea seeds in which they saved 20% more than they would have on individual purchasing. The group is now applying to obtain the licence for sale and purchase of fertilisers and pesticides. These farmers have purchased the share for membership in Jammu Oriental Fresh Farmer Producer Company Limited. Mr. Vivek Shahi (Local Project Coordinator of Jammu Actech) has stated that the success behind the groups is regular training and information provided on recent developments in agriculture. Today, this group is working as inspiration for other farmers.

Technical training has been organised in Udhampur on quality vegetable production and organic input application. A local exposure visit has been conducted to demonstrate model poly-house unit, vermi-composting, and plastic mulching in which farmers of Udhampur and Reasi district have participated. Agri-business activity has commenced in the FPO and members have collectively purchased 300 tool kits and 250 plastic crates from Department of Agriculture on subsidy. In addition to this, Knol khol (20kg) and turnip (5kg) seeds have been purchased from the market at 20% less than the normal price. Farmers are highly enthusiastic about expanding the business further. They are also in the process of applying for availing the Equity Grant Scheme of SFAC.

Training on organic farming and collective purchase of inputs

Under Action Plans 2011-12, 2012-13 and 2013-14, approximately 100%, 100% and 51% of the financial target has been achieved, respectively.

Success Story

Jammu is one of the hilly states of India with a difficult terrain. But the undulating topography and difficult geography have not reduced the enthusiasm of farmers for learning something new. Farmers of Reasi district in Jammu are being mobilised into groups by Actech Agro and are being supported with modern techniques of agriculture. Around 21 farmer groups have been mobilised in this district for enhancement of production and quality improvement in vegetables. All the groups are openhandedly adopting the organic farming methods for

Members with plastic crates

FIG members provided with manuals on vegetable production

vegetable production and certification of the produce as organic. In this context, one FIG has been formed in Kalhaar village of Pouni Tehsil in which the majority of the members are female. This group is headed by a progressive female farmer member – Mrs Sharda Sharma, and there are around 10 female members and two male members in this group. The group has also opened its bank account and are availing of benefits under various Government schemes. Farmer groups have participated in the training programme of organic production methods and they are applying those techniques in their fields for vegetable production. With the active support of Mr. Vivek Shahi from Actech Agro, the farmer groups have been registered under the Farmers Club Scheme of NABARD. Farmers have been provided with plastic crates for packaging of graded vegetables. They have also participated in the training programme and learnt about the method of vermi-compost production. The Department of Horticulture, Reasi has supported the farmers by providing them with HDPE vermi-compost kit. As it is difficult to construct a permanent cemented vermi-compost production unit in hilly areas, the plastic vermi-compost unit proves to be very useful. The female farmer members are actively learning new techniques under the VIUC programme and applying the same in their fields. Observing the achievements and keen interest of female farmer members in this group, the Chief General Manager of NABARD has visited and interacted with the members and has assured them of regular support and guidance from NABARD. The District Agriculture Officer Mr. Mohan Lal has supported the farmers by providing them with subsidised seeds and manuals on vegetable production methods. Farmers became highly encouraged by this support and the opportunity to learn about new techniques of vegetable production under the VIUC scheme.

FIG members provided with HDPE vermi-compost kit

PUNJAB

In Fatehgarh Sahib and Ludhiana, around 20 FPO members have participated in a one-day training programme organised at PAU, Ludhiana. on post-harvest management and processing of vegetable crops. They have been provided information on preparation of potato chips, tomato sauce, and ketch-up in Sidhwan Bet block. Large numbers of farmers from all FPOs have participated in the Farmers Fair organised at PAU, Ludhiana. Various training programs have been organised in different blocks of Sangrur by the RI.

Training programme

The members of Fatehgarh Sahib Vegetable Producer Company have participated in a one-day training programme organised at KVK on bee-keeping and fishery farming. Similarly, farmers from Ludhiana and Patiala have visited the Farmers' fair at the Farm Machinery Testing and Training Institute in Hissar, Haryana, for learning about the latest farming technologies. As a collective activity, members of the Progressive Vegetable Growers Producer Company Limited have jointly purchased a mulching machine. For knowledge enhancement, a two day-training programme had been organised by the RI at different locations for Jalandhar with the participation of a large number of farmers.

Mulching machine purchased by FPO

Training programme

Under Action Plans 2011-12 and 2012-13, approximately 100% and 44% of the financial target has been achieved, respectively.

UTTAR PRADESH

In Varanasi, FIG meetings and cluster meetings are being organised on a regular basis and the FPO is progressing towards full-fledged formation. FIG members have started joint procurement and marketing. Recently they have purchased around 4 kg of cauliflower and chilli seeds. As a collective a ctivity, one FIG in Varanasi has jointly transported around 15,000 pieces of cauliflower and is highly motivated about carrying out other group activities.

Kisan Sabha at different locations

Western Region

The Western Region comprises the states of Goa, Gujarat, Maharashtra, and Rajasthan. Updates from these states are given below:

GOA

Aldona is a small village in Bardez block in North Goa where agriculture is the secondary occupation of the community. Farmers in this area grow vegetables mainly in the *Rabi* season. The majority of them grow chilly and leafy vegetables in this season to earn their daily bread and butter. Paddy is another major produce of the village. Though they do not face much problem in the production but marketing was always a major problem for them. They used to sell their produce on the roadside and spend their maximum time in marketing.

Training programme for FIG members

With the efforts of the RI and Department of Agriculture, the farmers have been linked with Goa State Horticulture Corporation Limited for selling their produce at prefixed rates. This initiative proved to be a remarkable step in marketing because the farmers can now directly sell their vegetables without wasting their time on the road side.

Under the VIUC project, several Farmer groups have been formed. Om Krishi FIG is one such FIG promoted by Indian Grameen Services (IGS). Around 10 farmers of the village joined the group to set an example for the other farmers in the village. They started contributing ₹ 100/- per month as thrift and also lending the money to its members as per their requirements. IGS under SFAC project assisted this FIG in conducting various awareness campaigns and trainings with the collaboration of the Agriculture Department. In this way, the habit of working together for the betterment of the community as whole was inculcated in these members. This gave them the required encouragement to produce more vegetables. The major problem of marketing has now been solved by linking these farmers with GSHCL so that they could save their time which can be better utilised in the field. This was the best example for the village and it was great achievement of the group. It gave a boost to their efforts and encouraged them further to foster the spirit of togetherness.

Financial Position of the Group

Sl. No.	Particulars	Amount
1	Savings/Thrift	38,000.00
2	Loans given	46,000.00
3	Subsidy availed from Dept.	15,500.00
4	Income from vegetable selling	22,563.00

The joy and happiness on the faces of these members speaks about their achievements. It is only because of this FIG that many other groups have been motivated for group farming and this practice will boost the production and also will encourage youths to enter into agriculture. This example can be implemented in other nearby Blocks. It will give a new touch to the traditional farming methods. Multi cropping system can be introduced by motivating these groups to go in for hybrid varieties.

In North Goa and South Goa, a FIG meeting has been organised and a tie-up has been made with the Directorate of Agriculture for obtaining subsidised seeds in the *Rabi* season. Members of Krishi Samruddhi Farmers Producers Company Ltd and Krishi Sujalam Farmers Producers Company Limited have been provided with training on seed treatment conducted by the Directorate of Agriculture. In addition to this, members of Krishi Sujalam Farmers Producers Company Limited in South Goa have been provided with training on production management. Two FPOs Krishi Samruddhi Farmers Producers Company Ltd and Krishi Sujalam Farmers Producers Company Limited are under the process of registration till date.

Training programme

Under Action Plan 2011-12, 54% of the financial target has been achieved.

Saraswati FIG – an inspiration to the farming community

Gulem is a small village in Canacona block in South Goa where agriculture is the primary occupation of the community. Farmers in this area grow vegetables throughout the year. Chilli is the major crop that helps villagers to earn their daily bread and butter. In addition to this, paddy and cashew are also grown as the major crops.

Saraswati FIG is one of the FIGs in Gulem village formed with the guidance of Indian Grameen Services (IGS) under the project of Vegetable Initiative for Urban Clusters. Around 11 women farmers in the village have joined the group to set an example for the farmers in the village. FIG members started contributing ₹50/- per month as thrift for common use and they are also lending money to its members as per their requirements.

Under the project IGS assisted this FIG in conducting various awareness campaigns and training programmes with the collaboration of the Agriculture Department. It has inculcated in them the habit of working together for the betterment of the community as a whole. The Department of Agriculture is also providing hybrid seeds, free of cost, which has helped to discontinue the practice of multi-cropping in the area. Produce is being marketed directly by the group to Goa State Horticulture Corporation at prefixed rates.

Chilli cultivation

Joint efforts of the farmers are now paying off and this is the not only the benefit, but also the understanding of the importance of group efforts. This can be implemented in other nearby blocks and it will give a new touch to the traditional farming methods. The old multi-cropping system can be stopped by motivating these groups to go for hybrid varieties. The social upliftment of the members in the group and their economic attainment through group efforts are appreciable. The social impact on the community is the green vegetable fields grown and managed by the group. Thus it can be said that, "Saraswati FIG is an inspiration for farmers in Gulem village.

MAHARASHTRA

Name of Farmer:	Shri Vivek Marotrao Wagh
Address:	At. Bopapur, Tq. Hinganghat, Dist. Wardha
Name of FIG:	Abhinav Farmers Interest Group
Resource Institute:	Vikasganga Samajsevi Sanstha, Ghatanji
Name of Project:	Vegetable Initiative Urban Cluster

Shri Vivek Marotrao Wagh is an active farmer from Bopapur village in Hinganghat block of Wardha district having 5 acres of farm land. There are 6 members in his family with agriculture being the main source of livelihood. Vivek Ji used to grow vegetables and arrange its sale through brokers and the traders. It was unprofitable for him due to non-receipt of reasonable recompense because of fluctuations in prices and lack of timely transport facilities but there was no alternative other than this. In the mean-time a FIG was formed in the village under the VIUC programme being implemented by the Resource Institute Vikasganga and Mr. Vivek became member of the FIG. Vikasganga has guided the FIG members regarding overcoming such problems. In order to stop this plunder the farmers were encouraged to sell their vegetables directly to the consumers, avoiding the detrimental services of middleman. On the other hand, a four-wheel vehicle to be used as mobile vegetable sale centre was provided to Shri Vivek Wagh at 50% subsidised cost from the Maharashtra State Agriculture Marketing Board (MSAMB), Pune, under the VIUC programme for initiation of producer-consumer direct linkage. The four wheel vehicle Max Bolero was bought by the farmer for ₹ 4.80 lacs and the modification cost incurred to make it suitable as a mobile sale centre was ₹ 0.70 lacs. The total cost of vehicle was ₹ 5.50 lacs against which the farmer got ₹ 2.00 lacs as subsidy. The transport capacity of vehicle is 10 qtl at a time. Thus Shri Vivek collects 7-8 qtl of vegetables daily from the FIG and also from FIG at Daroda village and transports it to Manewada and Gitti Khadan area in Nagpur city for direct sale to the consumers. The benefit of direct sale is as below:

Direct marketing through mobile sales centre

Quantity of vegetables	Cost of vegetables in general	Cost earned by direct sale	Gross profit	Transport expenses	Net profit per day
7-8 qtl	₹ 6000/-	₹ 8500/-	₹ 2500/-	₹ 1100/-	₹ 1400/-

This has opened a new way of earning for the the farmer and enabled him to fetch a good price for the vegetables for another 15-20 farmers. Shri Vivek gives credit to the VIUC programme, the, Vikasganga Sanstha and the Agriculture Department, Wardha, for receiving this livelihood opportunity.

Maharashtra

Onion is a short duration crop with low cost of cultivation and can be grown using less amounts of water. This has been proved from the experiment done by the farmer Mr. Kailas Gopalrao Kaneir belonging to Amrawati district of Maharashtra. Mr. Kailas stated that good production is possible by good crop management without any extra effort.

As onion is an integral part of Indian food and has great medicinal properties too, therefore, there is a large scale demand for it all over the country as well as the world. Considering its importance, Mr. Kailas cultivated the crop in 3 acres area by raising a nursery of saplings. Mr. Kailas is also a FIG member of Amrawati FPO; therefore, he participates in various training programmes conducted by the District Agriculture Department and the RI Vikas Ganga Samajsevi Sanstha (VGSS). In view of the various aspects of cultivation and marketing, Mr. Kailas thought to take guidance from Agriculture Department Maharashtra State and Vikas Ganga Samajsevi Sanstha, Ghatanji, about an appropriate package of practices for onion cultivation.

Before plantation he applied a mixture of 25 kg Nitrogen and 15 kg of Potassium in the field and applied the same dose after 30 days. After 90 days duration, he obtained a bumper production of approximately 60 MT from three acres of land. The total expenses incurred on production of onion is as below:

Seed	₹ 9600.00
Preparation of nursery	₹ 5000.00
Plantation	₹ 20000.00
Wages	₹ 20000.00
Harvesting	₹ 15000.00
Storage and transportation	₹ 75000.00
Total	**₹ 144600.00**

Mr. Kailas has also constructed a shed for using as a store house with a capacity to store 70 MT of onion for selling in the peak demand season.

He has assumed that if he gets ₹20000/- per MT, then he will be able to earn ₹1200000/- for 60 tonnes. He will get a net income of ₹1055400/- after subtracting the expenses of ₹144600/-.

Eastern Region

The Eastern Region comprises the states of Bihar, Jharkhand, Odisha, West Bengal. Updates from these states are given below:

BIHAR

BoD members of Prakash Agro Producer Company Limited in Biddupur block of Vaishali district shared that they have established a market which is quite near to the FPO. The land for establishing the market has been provided by an FPO member – Mr. Dhanai Singh who is a member of Adarsh Phal Evam Sabji Utpadak Sangh (FIG). Farmers are carrying out direct marketing through this market and on an average approximately 50 qtl of produce is being marketed daily. FPO members are planning to expand this market in the upcoming season. The BoD members made a lot of efforts in establishing this market. Especially the company's CEO Mr. Jai Prakash Rai and member Mr. Ram Bali Bhagat had played a vital role in this regard. These members had convinced all the members of the FIG to sell their produce in this market only and their efforts are proving fruitful. The BoD members also shared that if the Government provides some support to them in this direction then they can set up a better market.

Market space provided by FPO member Mr. Dhanai Singh

Area for expanding market space

Under Action Plans 2011-12, 2012-13 and 2013-14, approximately 100%, 94% and 58% of the financial target has been achieved, respectively.

ODISHA

Collective Marketing: A Joint Approach for Economic Development

Farmer Interest Groups have been formed in Banki 1 block of Cuttack district, Odisha under the FPO promotion programme promoted by SFAC. CTRAN Consulting has provided the training to all the members with the support of Directorate of Horticulture, Odisha. In trainings, programmess, farmers have been provided with information about the marketing aspects and benefits of collective efforts. The staff of CTRAN Consulting sensitised the farmers about the collective approach. Before the intervention of SFAC, there was the interference of the marketing middle man in all the marketing channels, and the farmers were exploited in terms of price. They never received the exact amount for their produce as per the market rates.

Brinjal production

Marketing was one of the major concerns of farmers. Recently they realised that the problem has to be sorted out by themselves; therefore, the FIG members decided to solve this problem by adopting collective marketing. Initially four FIGs namely Maa Bauti Vegetable Farmer Group, Jay Bajrangi Vegetable Farmer Group, Trinath

Vegetable Farmer Group, Maa Kalapat Vegetable Farmer Group have started collectively selling their produce in Nua Sunakhala market. They have collected the brinjals from FIG members and hired a tempo to take the brinjals to the market. The President and Secretary of the four FIGs discussed with the market agent and negotiated about the rates beforehand.

A total of 404 qtl of brinjal has been sold in Nua Sunakhala market by these four FIGs, in merely two months time. Brinjal of ₹ 10,89,800/- has been sold in the market by these groups. When they calculated the profit they realised that per quintal they are getting ₹ 2700/- when they are selling the produce collectively, while when it was sold individually in the same market they used to get only ₹ 1800/- to ₹ 1900/- per qtl.

Collective Marketing of Four FIGs of Banki 1 Block, Cuttack

Sl. No	No. of Farmers	No. of FIGs	Name of vegetable	Quantity sold (in qtl)	Total Amount (in ₹)	Name of Market
1	32	4	Brinjal	24	91200	Nua Sunakhala
2	40	4	Brinjal	22	79200	Nua Sunakhala
3	50	4	Brinjal	32	112000	Nua Sunakhala
4	48	4	Brinjal	42	126000	Nua Sunakhala
5	54	4	Brinjal	52	156000	Nua Sunakhala
6	64	4	Brinjal	50	130000	Nua Sunakhala
7	42	4	Brinjal	45	130000	Nua Sunakhala
8	32	4	Brinjal	40	80000	Nua Sunakhala
9	42	4	Brinjal	43	77400	Nua Sunakhala
10	62	4	Brinjal	54	108000	Nua Sunakhala

The FIG members after realising the outcome of collective marketing sensitised the farmers of other FIGs during monthly FPO meetings. And now other FIGs have also started collective marketing and some of the FIGs are planning to go for joint procurement of agri inputs for the coming season.

Odisha Success Story

Farming is the primary source of livelihood for the residents of Sanatanpali village of Jujumura block. Most of the farmers of this village are small to marginal who strive hard in the highly risky occupation of agricultural farming. A major portion of villagers cultivate different vegetables throughout the year on their farm land. Though the vegetable growers of this area face severe challenges to sustain their farming profession and livelihood security, they have not lost their passion for innovative ideas and practices to increase the production and productivity of major vegetables. This statement has proved true for a farmer namely Iswar Sahu who is also a vegetable grower and is always one step ahead due to his innovative ideas about farming. He belongs to the Hariom FIG of Sanatanpali village. During a sensitisation meeting under the VIUC scheme, he had expressed his interest to do un-seasonal vegetable cultivation in his field poly-house. Eventually he constructed a pucca building. Soon after completion of the roof of the house he watered the roof by following the traditional soil bunding method. After 6/7 days when he went to remove the soil from the floor of the roof, he thought about growing vegetables by using this soil. Then he started roof-top vegetable cultivation. On a trial basis he started tomato cultivation in the last 2 years.

Roof-top cultivation of tomato

In the first year (2013) he cultivated 100 tomato plants on the roof-top using the staking system. He started the cultivation from 3rd week of August after raising the seedlings. Initially he prepared a mixture by adding soil, manure and vermi-compost. By the time (15th September) the plants achieved a height of 1.5 to 2.00 ft., he had only applied 20 to 25 gm of DAP in each plant and after 25 days again also applied same amount of fertiliser to the plants. The result of another measurement found that the plants attained 4 ft to 5ft of height and the production was 14 to 15 kg per plant. Besides that, he also sprayed "Funda cluser (Hormone)" at specific intervals to raise the production and quality of the fruits. In total, he had invested around ₹1300 to 1500 and on an average procured 14 qtl of tomato. The gross selling value was ₹21000. He obtained a **net profit of over ₹18000** after deducting all the expenditure and losses.

In the second year (2014), he cultivated 200 tomato plants in 1200 sq m of roof-top area during the second to last week of August by following the same procedure. He prepared the mixture by adding soil, manure, vermi-compost, neem cake, fertiliser and chemicals. Prior to transplanting of the tomato plants, cement bags (half bags) were filled with 25 to 30 kg of mixture and placed line by line. About 200 such bags were put in this manner and the seedlings were transplanted. After the survival of these plants, very small amounts of fertiliser were applied (two or three times) as per requirements. Watering was carried out twice a day on a regular basis (1ltr per plant per day). Pesticides were also applied as per requirement. This time the average production was 20 kg per plant and total production near about 38 to 40 qtl, without any loss. The gross return obtained was ₹75000 to ₹80000 with a selling price of ₹20 per kg. The total expenditure incurred by the farmer was about ₹10000 to ₹15000. After deducting the expenditure from the gross return, he realised a **net profit of 60000 to ₹70000** (excluding the costs of family labour).

Impact assessment

- With less investment and less use of chemicals he is able to produce semi-organic tomato.
- Chances of pest and insects attack is very little due to less infestation of weeds.
- Family members can carry out this activity easily; therefore, labour and land preparation cost is very low (80% less).
- Room temperature can be maintained side by side for creating a good micro environment.
- Roof-top cultivation can be done during the late rainy season which is not possible in case of surface cultivation.
- The early production helped to sell the outputs at a remunerative price.
- The high profit enabled him to purchase some durable assets and modern farm implements (transplanted) which can save the labour cost for transplanting.
- He feels proud when visitors across districts and states visit his plot and it has encouraged him a lot.
- His success made him to get an opportunity to visit other states to learn and share the best practices of agriculture.
- His recognition as a progressive farmer has enabled him to receive rupees 9 lakh from the Horticulture Department for establishing mushroom seed production.
- The success story inspired other farmers to come forward to do tomato cultivation on staking system. The following farmers from the same village are now cultivating tomato by following the same procedure in their crop fields:
  - Nirakar Padhan- 100 plants
  - Bibhuti Bhusan Sahu- 50 plants
  - Lingaraj Sahu- 400 plants
  - Satya Narayan Sahu-50 plants

As per his opinion a farmer has ample scope to innovate and apply new ideas in his farm to enhance his income provided he has the passion to do so.

WEST BENGAL

FPO members of Bhangar Vegetables Producer Company Limited are carrying out sorting, grading, and packaging of vegetables in the pack house owned by the FPO which was constructed 2 years back by availing of 50% subsidy. Initially the pack house was used for packaged produce for Mother Dairy but now they are sending the produce to other states also. All the products are packed in small netted packets such as 50g for garlic, 250g for capsicum, 1 kg for potato, 500g for okra etc. After being packed these products are being sent to *Mother Dairy* counters at Kolkata city. There is a retail MRP chart for different vegetables which is also sent alongwith the products every day. Around 10% of the total sale value goes to the *Mother Dairy*. For formation of new FPOs, the RI ADS has organised training programmes about the FPO formation process for newly inducted staff members at Polerhat.

Sorting & grading in pack house by FPO members

Produce packed in netted packets

Training-cum-orientation programme

Under Action Plans 2011-12 and 2013-14, approximately 86% and 100% of the financial target has been achieved, respectively.

North Eastern Region

The North Eastern Region comprises the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Updates from these states are given below:

ARUNACHAL PRADESH

Smt Hibu Oche hails from Siiro village of Ziro Hills, is an educated lady, but due to the non-availability of proper employment opportunities she was unemployed and became frustrated. Though she had sufficient land area she was lacking the skills of a professional grower. Then from neighbour villagers, she heard about the VIUC scheme under which farmers are being mobilised and provided with technical assistance for vegetable production as well as input for production, and marketing support.

Smt. Hibu Oche's farm

Then she approached the Department of Horticulture and learnt about the improved package of practices for successful vegetable cultivation and also received various inputs under the scheme. Now she has become a full-time vegetable gardener after taking up vegetable gardening as her profession; she is successfully managing her family from its income. She grows vegetables like cabbage, brinjal, potato, tomato, and broccoli in 3 ha of area. On an average, she is obtaining a per month production of 15-20 of Tata mobile van loads. She sells these vegetables in the local market, Itanagar, Palin and Daporijo etc. using the vending van provided by the Department for jointly transporting the produce. On an average she earns ₹ 4.5 lakh per annum from vegetable production. She is highly thankful to the VIUC scheme.

Marketing on Tata Van

In Lower Subansiri, final harvesting and marketing of tomato and cole crops is going on at various locations. Earthing-up and weeding is in progress for newly transplanted seedlings. FIG members have been provided with vermi-compost, fungicides, tools, and plant protection chemicals.

Inputs for distribution to FPO members

Cleaning of tomato after harvesting

Under Action Plans 2011-12, 2012-13, and 2013-14, approximately 100%, 50% and 100% of the financial target has been achieved, respectively.

MANIPUR

One of the two collection centres-cum-pack houses under VIUC programme in Imphal West district has been constructed at Lamnonglei village under the supervision of FIG vegetable farmers group, Lamnonglei. The secretary of this FIG is a woman named Sh. Gitarani Devi. Under her supervision, she and other FIG members collect almost all the vegetable crop products for Lamnonglei village and other adjacent villages covered under VIUC, in the collection centre and pack house. The crops are brought by bicycle or auto-rickshaw or by head load. The bicycle is steered by a man and push by a woman. Collected crops like cucumber, tomato, beans, bhindi are sorted out and packed in gunny bags. The sorted out products are taken to "Khwairamband Bazaar" the main vegetable market at Imphal City. As such there is no middleperson in the transaction of vegetable products from field to the main market. Sorted out and graded produce fetch a higher price in market. FIG members are highly pleased with the construction of collection centre-cum-pack house.

Unloading of produce at collection centre

Produce carried on bicycle

Under Action Plans 2011-12, 2012-13, and 2013-14, approximately 100%, 50% and 47% of the financial target has been achieved respectively.

Manipur

Seedling production in green house

Women member participation and success in the VIUC scheme could be easily seen in Manipur. One of the farmers listed as a FIG member of Kameng is a woman named Pramodini Devi. She has participated in the scheme and availed of subsidy for construction of a green house (tubular structure) covering 120 sq m for vegetable seedling production at her farm. Pramodini Devi is involved in the seedling production business for more than 20 years.

Earlier she was carrying out seedling production in the traditional manner by growing the seedlings in an open field for vegetables like cabbage, onion, cauliflower, tomato, brinjal etc. During that time, she was earning around ₹20,000 in the *Kharif* season and ₹35,000 in the Rabi season. After the implementation of the VIUC programme in Manipur, she learnt about the modern production practices through various training programmes organised by the Nodal Department as well as the Resources Institution. She also learnt about seedling production under green house structure and has been benefitted. After the construction of the green house, she now earns around ₹35,000 to 40, 000 during the *Kharif* season and ₹55,000 to 60,000 during the Rabi season since the last 2-3 years. Seedling production under green house structure saved the losses due to bad weather and infestation of pests and diseases. She sells the seedlings products directly at Sekmai market, Imphal West District or Motbung or Kanglatongbi Bazaar Sadar Hills at Senapati district.

Meghalaya

The intervention of the VIUC Scheme has had a positive impact on the beneficiaries selected under the Mawryngkneng Development Block. The efficacy of this scheme has brought changes in the mindset of many poor farmers who have responded positively, thereby changing the entire socio-economic status of the people in the area. The Department of Horticulture and Indian Grameen Services – a Resources Institution portrays the success of vegetable cultivation through the beneficiaries of a cluster of farmers.

Over the years farmers have been cultivating and working as individual farmers prior to the intervention of the VIUC scheme where they concentrate their agriculture enterprise by growing bits and pieces of different kinds of both agriculture and horticulture crops, but it was their sincere efforts that made them one of the promising vegetable growers of the area. The implementing agencies without any doubt selected the area for mobilising Farmers Interest Groups (FIGs). For instance **Iasynroplang Farmers Interest Group** of Mawlyngngad village takes the benefit of the scheme and is cultivating various types of vegetables in their farms. Members of the FIG have been given inputs like seeds, hand-tools as well as subsidy for constructing poly-houses for protected cultivating. The beneficiaries got the opportunity to attend various training programmes organised for promoting agriculture produce, to understand the various cultural practices, technical support and this has enabled them to strengthen their knowledge of modern concepts. Their farm records revealed that the overall expenditure for an individual farmer right from land preparation to harvesting is ₹97,500/- covering all aspects. Now they have managed to arrive at the point where their produce cultivation has produced a remarkable profit of ₹3,02,500/-.

Southern Region

The Southern Region comprises the states of Andhra Pradesh, Telangana, Karnataka, Kerala and Tamil Nadu. Updates from these states are as below:

KARNATAKA

Shri Sunil Kolgaonkar is a very progressive and active farmer of Hubli post of Dharwad district. Dharwad is the newly implemented cluster of VIUC scheme in Karnataka in 2012-13 programmes. Shri Sunil has 4 acres of land, and agriculture is the main source of livelihood for him and his 10 members' family. As per the interaction with Mr. Sunil, prior to the implementation of VIUC scheme, he was cultivating paddy as the main crop and some other crops on 3.5 acre area. Only 0.5 acre of land was used for cultivation of vegetables for domestic consumption. At that time, his economic condition was very poor. It was very difficult for him to run the 10 members' family. Throughout the year, he was going into debt as he needed to take loans from money lenders for fulfilling his daily requirements. His condition was becoming pathetic day by day.

Bio-digester unit

Variety of vegetables grown in Mr. Sunil's farm

But in the year 2013-14, he became aware of the VIUC scheme from fellow farmers, and then he joined the group and formed the FIG. He also received training about vegetable cultivation practices from the Department of Agriculture and also motivated other farmers for carrying out vegetable cultivation. He observed that the benefits earned from vegetable cultivation are three times more than that from other crops. The main advantage from vegetable cultivation is that he can continue the cultivation throughout the year and earn a sizeable income. Now he was not compelled to borrow money for his daily requirements. Mr. Sunil also availed of various subsidies provided under the scheme and has been much benefitted by the VIUC scheme.

Karnataka Farmers Benefit from Vegetable Production

Mr. Mahesh at his field

Vegetable production is proving to be highly beneficial for the farmers in Mysore district of Karnataka. On interaction with various members of the Farmer's group namely Shree Mahadeswa Tharakary Belehara Gumpo Echegundele in Mysore, it has been observed that the farmers are taking up vegetable production more actively than cereal crop production. The most important benefit is that vegetable production can be taken up throughout the year. There are around 15 members in the group and Mr. Mahesh is one of the progressive farmers of the group. Mr. Mahesh stated that vegetable production under the VIUC scheme has provided them with an opportunity to earn a regular income throughout the year. He stated that vegetable production is providing more net income as compared to cereal crop production from the same land area.

Crop	Area under cultivation (acre)	Production (MT)	Expense	Gross income	Profit
Green chilli	2.5	15	₹1.5 lakh	₹4.5 lakh	₹3.0 lakh
Paddy	2.5	20	₹1.0 lakh	₹2.0 lakh	₹1.0 lakh

Mr. Mahesh is obtaining more than double the profit from vegetable cultivation than from cereal crop production. Earlier he was not much aware about the appropriate vegetable production methods. After participating in the VIUC scheme, he became aware of modern vegetable production methods and also availed of subsidy on various inputs. The procurement centre in the cluster has solved the problem of marketing to some extent.

KERALA

With the introduction of the VIUC scheme, the farmers in Palakkad cluster have been substantially benefitted in terms of marketing. From an interaction with Mr. Shinod Kumar, belonging to Chatananmangla village of Palakkad district, we learned that marketing was the major problem for farmers in this cluster because district the Headquarter was 50 km away from the village. For transportation and marketing of their produce, heavy charges were incurred. Approximately ₹ 1000 was incurred per trip carrying 6-7 qtl of produce for transportation and commission charges and 2 persons were involved for the whole day. After the formation of FIGs under the VIUC scheme, these farmers started collective marketing in which the transportation as well as middlemen charges have been reduced to a substantial extent. Now they simply call up the wholesaler to know the price and collectively send the produce to Palakkad or Coimbatore market where they received spot payment. Only one trip is required and they are saving 50% on transportation of produce. Farmers have become highly motivated with the introduction of the VIUC scheme in this area and have been encouraged for vegetable cultivation.

Kerala

Vegetable production

Mr. Imchunny is a very progressive farmer of the Chathamangalam village of Kozhikode (Calicut) district. Prior to the implementation of the VIUC scheme, Mr. Imchunny was cultivating only paddy and a few other crops on his field. He was not aware about the benefits of vegetable crop production and was earning very small amounts twice in a year. Throughout the year, he remained unengaged in any field work. For family requirements he was compelled to take loans on heavy interest from money lenders during the idle season.

After implementation of the VIUC scheme, he was motivated for vegetable cultivation by the Department of Agriculture. He obtained training about the methods of production and started vegetable production on his land. The introduction of vegetable production greatly increased his sustenance opportunities, especially during the idle season. He also mentioned that for selling of paddy and other cereal crops, they are dependent on local traders at the village level on a margin of 5-10%, while for selling of vegetables the Department of Agriculture has opened a procurement centre at the village. Farmers bring their produce to this procurement centre without incurring any additional charges. He has been highly benefitted by the growing of vegetables and is now obtaining a regular income throughout the year.

Waste Management and its Benefits

It is estimated that in India about 100,000 tons of human excrement is left each day in fields of potatoes, carrots and spinach, on banks that line rivers and along roads. This faecal load generated every day is largely due to open defecation and the absence of facilities for a sanitary disposal of excreta. Open drains and disposal of solid waste near sources of water lead to the presence of ammonia in the drinking water sources. Defecation on the boundaries of water bodies results in bacteriological contamination of the water.

Farms near cities often supply relatively inexpensive food to households in these cities. Most of these operations draw irrigation water from local water sources. Facing water shortages and escalating fertiliser costs, farmers in many developing countries end up using raw sewage to irrigate and fertilise their cropland and India is no exception. When sewage sludge is used, the use of expensive chemical fertiliser can be avoided as the sludge contains the same critical nutrients i.e. nitrogen, phosphorous, and potassium (NPK). Unfortunately, when this sludge is used for agricultural irrigation, farmers risk absorbing disease-causing bacteria and so do consumers who eat the produce raw and unwashed. This poses a huge problem when farmers try to market, in particular export, these crops as they fail the stringent contamination standards in the developed markets.

Many environmental scientists, however, argue that the social and economic benefits of using untreated human waste to grow food outweigh the health risks. Irrigation is the primary agricultural use of human waste in the developing world but frequently untreated human excreta harvested from latrines is delivered to farms and spread as fertilizer.

With several new and time-tested indigenous technologies available for recycling waste water and for treating human waste, the attractiveness of using this highly available low cost alternative can be suitably refined and enhanced. Though such pertinent and effective technologies are available, little has been done to educate farmers on the benefits of such solutions. While civil society organisations, under the aegis of several Government schemes, have built sanitation facilities in villages, they have often remained unutilised. The reasons for this could be myriad- from cultural practices to fear of drinking contaminated water - but an overarching fact remains that many of these measures have been thrust on the rural residents without their active buy in, ownership or their understanding of the advantages that these could bring.

The fact that the by-products of such solutions have a commercial value has either not been adequately explained to the farmer or its deployment, exploitation and commercialisation has been beyond the reach of individual famers. Simple measures like source separation and composting can be beneficial not only for the environment, but in themselves can earn returns for the farmers. Most of the necessary plant nutrients are found in human urine. Based on data from five countries (China, Haiti, India, South Africa and Uganda) it has been estimated that on average each person produces about 5 kg of elemental NPK in excreta per year i.e. about 4 kg in the urine and 1 kg in the faeces.

Urine is therefore worth using as fertiliser, especially as its content of NPK is readily available to the plants. The concentrations of heavy metals in human urine are negligible, an important advantage over chemical fertiliser. Urine can be applied in a variety of ways including in undiluted form to soil beds before planting where the bacteria in the soil change the urea into nitrate which can be used by the plants, during the entire cropping cycle as a liquid plant food and as an 'activator' for compost heaps where the transformed organic nitrogen will be available to plants when the compost has matured. Concentrated fermented urine can also be applied to beds of dried leaf mold, as a medium for growing vegetables and ornamental plants. A future possibility, when large amounts of diverted urine are available from urban areas, is to use human urine to produce a concentrated fertiliser in powder form.

Similarly, when human faecal matter is separated from the liquids using source separation toilets, the solid matter can be combined with farm waste and animal waste in large plastic tanks allowing for the gases to be tapped from the top, either to be used for cooking, lighting or for electricity generation, and the solid matter can be composted and dried into usable fertiliser, either by the farmers themselves or with the support of third party organisations in the business.

FPOs have rightly started representing the interests of member farmers. Joint activities as far as production, procurement of inputs and marketing of produce have strengthened the voice and the bargaining power of farmers. FPOs have also actively started foraying into avenues like dealerships, carbon credits, sale of specialised inputs and forging partnerships that would create additional sources of income for farmers. The tapping and marketing of all the by-products from waste management can be grown into viable and profitable businesses.

FPOs/FPCs can be considered as partners in marketing such comprehensive eco-sanitation-based waste management solutions in rural geographies. As members of the local rural communities, FPOs would be in a better position to educate the community on

health and ecological benefits of such technologies while themselves benefiting from cleaner irrigation sources, using the collected urine as fertiliser, the sale of composted waste matter (farm, animal and human) as soil conditioners and using the associated bio gas for cooking-gas or generating electricity.

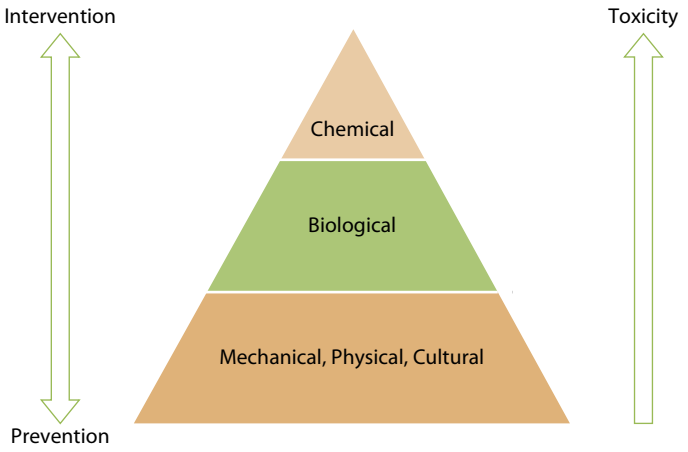
FPOs could also avail of Government subsidies available for the promotion of such schemes and provide an invaluable service in facilitating the Government's outreach in these areas.

Integrated Pest Management during the *Rabi* season in vegetable crops

Vegetables are an integral part of our diet and India is the second largest producer of vegetables in the world. As per the second advance estimates of 2013-14 (National Horticulture Board), the annual production of vegetables is 170 million tonnes, however, productivity is only 18 ton/ha which is fairly low as compared to the productivity of other leading vegetable-producing countries. One of the major constraints related to low productivity in vegetable production is the losses caused by the vegetable pests. At present, various pests cause losses in the range of 10-20%, depending upon the severity of the infestation and the type of terrain. Of the total cultivation cost, a major percentage of the cost is incurred for pesticide application. It is a known fact that the use of chemical pesticides for controlling the infestation of pests causes pollution, destruction of natural enemies as well as leaves a heavy residue in the produce. With time, the pests also develop resistance to most of the pesticides that have been repeatedly applied. In this scenario, there is a need for the prudent application of pesticides alongwith integration of eco-friendly techniques for control of pests.

The *Rabi* season cultivation has begun and farmers in most parts of the country have commenced appropriate agronomic practices. Among all agronomic practices involved in vegetable production, pest management is one of the most important practices that impacts healthy crop production. *Rabi* season vegetables like peas, carrot, radish, spinach, turnip, tomato, capsicum, potato and other cole crops face heavy losses due to pests' infestation. Integrated Pest Management is the most appropriate method for controlling pests in such circumstances, because merely application of pesticides is not sufficient, considering the environment and economic concerns.

Fruit-borer, thrips, mites, leaf-hoppers, miners, white flies, diamond back moth, cabbage caterpillar, leaf webber, and fruit flies are the main pests of the *Rabi* season vegetables which cause, at an average, about 25-35% loss in production, and after adding the post-harvest losses, the numbers seem more alarming. It needs to be curbed in time using integration of several chemical, non- chemical, biological, modern and other traditional practices.



Integrated Pest Management approaches for pest management in vegetables

Cultural practices are among the oldest techniques used for pest suppression, and many of the practices are used in conventional and organic farming today. Application of cultural practices is the most suitable and cost-effective method which does not require many inputs, but it needs a proper planning. The basic strategy for controlling pests using cultural practices is making the crop unavailable to pests in space and time, making the crop unacceptable to pests by interfering with the host preference, reducing pest survival by enhancing natural enemies and altering the crop's susceptibility to pests.

Cultural practices involve the application of practices like:

- Crop rotation, inter-cropping, trap crops
- Hot and cold weather cultivation, mulching
- Use of healthy seeds
- Adjusting planting and harvesting dates
- Judicious irrigation and sanitation

Crop rotation interrupts the normal life cycle by creating a non-host habitat. For instance, the following crop combinations may help in reducing the pest infestation without incurring any extra cost:

Crop combination	Target pest
Cabbage + Carrot	Diamond back moth
Broccoli + Faba bean	Flea beetle
Cabbage + French bean	Root fly
Cabbage + Tomato/carrot/mustard	Diamond back moth
Cabbage + Chinese cabbage	Diamond back moth

Alterations in planting and harvesting dates frequently results in plants escaping from damaging pest infestations. Soil solarisation and use of mulching is a non-chemical method for controlling soil-borne pests using temperature differences. In addition to this, the

use of healthy seeds, judicious irrigation, and sanitation, timely clipping of infested shoots etc., greatly helps in reducing pests by creating a healthy environment.

Plastic and straw mulching

However, cultural practices alone will not be able to control pests completely, therefore, it needs to be integrated with biological and chemicals methods.

Biological control consists of practices like:

- Use of resistant varieties
- Introduction of natural enemies
- Bio-fumigants
- Naturally occurring bio-control agents
- Pheromones and botanicals

The use of resistant varieties is a good alternative with minimal impact on the environment, but in some cases it may be a little costly, and its timely availability is another important issue.

Under the VIUC programme, farmers are also being provided with information about organic farming and IPM components. Various inputs for pest management are being provided – like insect traps and lures etc. At some places, farmers are using yellow sticky pads for pest control. Cross pollination of such ideas may benefit the farmers of other states also. These farmers can be trained in using other practices for pest control.

The use of bio-control agents like Trichogrammatoids, chrysoperla, NPV (Nuclear Poly-hedrosis Virus), *Bacillus Thuringiensis* is highly effective for the control of tomato and cole crop pests. Trichogrammatoids, chrysoperla help by acting as natural enemies; though the application of these bio-agents is a little difficult for small farmers. In this case, plant products prepared from locally available plant materials and some daily household items like Karanj oil, mahua oil, neem oil, leaf extracts of lantana camara, bakain (Persian lilac), various neem- based formulations, neem seed kernel extract, methanolic of sadabahar (Vinca rosea)/ bottle brush can be used effectively for control of a wide range of pests. These materials are available locally and do not incur any extra cost in its production. In addition to this, there are some other preparations like Panchgavya which not only acts as bio-pesticides but also improves soil fertility. The use of various bio-formulations like Agni-astra, Agni-shamak, Brahma-astra, and the use of mulching highly reduce the pests' infestation. Though in some parts of the country, farmers are using such techniques, still the use of pesticides is more prevalent. Under the VIUC, farmers are being provided with training on organic farming methods, integrated pest management methods, but very few methods are being covered under the training programmes.

Pheromone trap in field

Panchgavya application

Demonstration-cum-training programmes can be organised by the resource institutions and the Nodal Department for application of such eco-friendly techniques for pest management. Farmers can also approach local KVKs for learning about these methods. A small chart has been appended below giving information about some important formulations.

Customised formulation prepared from local materials

These practices will greatly help in lowering the economic-injury level but they do not provide fool-proof, complete control. If proper planning is done then pests can be controlled to a great extent with the least application of chemical pesticides. Chemical pesticide application should be used only when other control practices have failed, or if they prove ineffective, uneconomical, and impractical. Rather, chemical pesticide application combined with the cultural and bio-control practices will help to eradicate and control pest infestation more effectively in a few sprays.

Formulation	Impact	Ingredients
Neem-astra	Protection from leaf-sucker, red spider, grasshopper	Water, cow-dung, cow- urine, neem leaves
Agni-astra	Protection from fruit and shoot-borer, leaf-sucker	Water, cow-urine, green-chilli, tobacco
Bramh-astra	Protection from fruit-borer, leaf-sucker and almost all types of harmful insects	Water, cow-urine, (neem, harebell, guava, custard apple, lantana-camara, pomegranate, papaya
Agni-shamak	Protection from all types of shoot and fruit-borers and leaf-sucker	Green chilli, garlic, kerosene, surf
Panchgavya	Pest repellent, immunity booster, improved healthy soil microbes	Cow-dung, ghee, cow-urine, milk and curd, jaggery, water, coconut-water and ripe banana

SFAC
लघु कृषक
कृषि व्यापार संघ

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